

299-W11-55 (A7297) Log Data Report

Borehole Information:

Borehole: 299-W11-55 (A7297)		Site: 216-T-6 Crib			
Coordinates (WA State Plane)		GWL (ft)¹: Not deep enough		GWL Date: 1/30/2003	
North	East	Drill Date	TOC² Elevation	Total Depth (ft)	Type
136,670.04 m	567,198.31 m	June 1947	218.066 m	155.8	Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Welded steel	3.25	8 5/8	8 1/16	0.281	+3.25	150
The logging engineer measured the casing stick up using a steel tape. A caliper was used to determine the outside casing diameter. The caliper and inside casing diameter were measured using a steel tape. Measurements were rounded to the nearest 1/16 in. Casing thickness was calculated.						

Borehole Notes:

Borehole coordinates, elevation, and well construction information are from measurements by Stoller field personnel, HWIS³, and Chamness and Merz (1993). Zero reference is the top of the 8-in. casing. A reference point survey "X" is located at the top of the casing stickup.

Logging Equipment Information:

Logging System:	Gamma 2A	Type:	SGLS (35%)
Calibration Date:	9/2002	Calibration Reference:	GJO-2002-383-TAC
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4/Repeat	
Date	2/06/03	2/07/03	2/10/03	2/10/03	
Logging Engineer	Spatz	Spatz	Spatz	Spatz	
Start Depth (ft)	54.0	155.0	71.0	49.0	
Finish Depth (ft)	4.0	70.0	53.0	34.0	
Count Time (sec)	200	200	200	200	
Live/Real	R	R	R	R	
Shield (Y/N)	N	N	N	N	
MSA Interval (ft)	1.0	1.0	1.0	1.0	
ft/min	N/A ⁴	N/A	N/A	N/A	
Pre-Verification	BA195CAB	BA196CAB	BA197CAB	BA197CAB	
Start File	BA195000	BA196000	BA197000	BA197019	
Finish File	BA195050	BA196085	BA197018	BA197034	

Log Run	1	2	3	4/Repeat	
Post-Verification	BA195CAA	BA196CAA	BA198CAA	BA198CAA	
Depth Return Error (in.)	-0.5	+0.5	N/A	-0.5	
Comments	No fine-gain adjustment.	Fine-gain adjustment after files -002, 004, and -011.	No fine-gain adjustment.	No fine-gain adjustment.	

Logging Operation Notes:

Zero reference was top of the 8-in. casing. Logging was performed with a centralizer installed on the sonde. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT (^{40}K , ^{238}U , and ^{232}Th) verifier with serial number 082. During SGLS logging, fine-gain adjustments were needed to maintain the 1460-keV (^{40}K) photopeak at a pre-described channel.

Analysis Notes:

Analyst:	Sobczyk	Date:	03/03/03	Reference:	GJO-HGLP 1.6.3, 2003
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SGLS pre-run and post-run verification spectra were collected at the beginning and end of each day. The verification spectra were all within the control limits established on 12/05/2002. The peak counts per second (cps) at the 609-keV, 1461-keV, and 2615-keV photopeaks on the post-run verification spectra as compared to the pre-run verification spectra for each day were between 6 percent lower and 1 percent higher at the end of the day.

Log spectra for the SGLS were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Post-run verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC SUPERVISOR. Concentrations were calculated in EXCEL (source file: G2AFEB03.xls), using parameters determined from analysis of recent calibration data. Zero reference was the top of the 8-in. casing. On the basis of Chamness and Merz (1993), the casing configuration was assumed to be one string of 8-in. casing to the maximum depth of the logging (155 ft). The casing correction factor was calculated assuming a casing thickness of 0.281 in. This casing thickness is based upon the field measurement. A water correction was not needed or applied to the data. Dead time corrections are required when dead time exceeds 10.5 percent. As the dead time did not exceed 10.5 percent, a dead time correction was not needed or applied.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K , ^{238}U , and ^{232}Th), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. In addition, a comparison log plot of man-made radionuclides is provided to compare the data collected in 1993 and 1995 by Westinghouse Hanford Company's Radionuclide Logging System (RLS) with SGLS data. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. The ^{214}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 609 keV because it exhibited slightly higher net counts per second.

Results and Interpretations:

^{137}Cs was the only man-made radionuclide detected in this borehole. ^{137}Cs was detected near the ground surface at log depths between 6 and 8 ft. The range of concentrations was from the MDL (0.2 pCi/g) to 1 pCi/g. ^{137}Cs was detected in the interval from 29 through 67 ft. The range of concentrations was from the MDL to 187 pCi/g, which was measured at 31 ft. ^{137}Cs was also detected near the MDL at 71 and 73 ft.

Recognizable changes in the KUT logs occurred in this borehole. Changes of 5 pCi/g or more in apparent ^{40}K concentrations occur at approximately 40, 89, 105, 122, 127, 139, and 143 ft. The increase in ^{40}K concentrations at about 40 ft may represent the transition from the coarse-grained sediments of the Hanford H1 to the finer grained sediments of the Hanford H2. Between 105 and 122 ft, the fine-grained member of the Cold Creek Unit (formerly known as the Early Palouse Soil) is shown by an increase in total gamma (75 cps) and ^{232}Th (0.5 pCi/g). An approximate 8-pCi/g decrease in ^{40}K concentrations was observed in the intervals between 122 through 127 ft and 139 through 143 ft. ^{238}U increases by approximately 2 pCi/g in the interval between 139 and 143 ft. On the basis of low ^{40}K concentrations, the carbonate-rich paleosols of the Cold Creek Unit are interpreted as being in the intervals between 122 and 127 ft and 139 and 143 ft. The caliche layer with characteristically high uranium content (greater than 2.0 pCi/g) is present between 139 and 143 ft. ^{232}Th concentrations decrease by approximately 0.3 pCi/g in the interval between 139 and 154 ft.

The plots of the repeat logs demonstrate reasonable repeatability of the SGLS data for ^{137}Cs (662 keV) and natural radionuclides (609, 1461, 1764, and 2614 keV).

Gross gamma logs from Fecht et al. (1977) (attached) indicate that the sediments surrounding this borehole contained significant amounts of man-made gamma radiation from 1958 through at least 1976. The logs from 2/26/58, 4/26/63, and 5/6/76 appear to detect relatively high gamma activity in the interval from 23 ft (7 m) to 46 ft (14 m). The SGLS detected ^{137}Cs from 29 through 67 ft.

Comparison log plots of data collected in 1993 and 1995 by Westinghouse Hanford Company (WHC) and in 2003 by Stoller are included. The WHC concentration data for ^{137}Cs are decayed to the date of the SGLS logging event in February 2003. Comparison of the ^{137}Cs concentrations indicates that the RLS data appear to overestimate the radionuclide concentration. ^{137}Cs concentrations on the SGLS in 2003 are lower than that predicted by the 1993 RLS log, and this difference is probably derived from the assumption of different casing thicknesses. A casing thickness of 0.322 in. was used to estimate the ^{137}Cs concentrations based on the 1993 RLS data versus 0.25 in. for the 1995 RLS and 0.281 in. for the 2003 SGLS data.

References:

Chamness, M.A. and J.K. Merz, 1993. *Hanford Wells*, PNL-8800, Pacific Northwest Laboratory, Richland, Washington.

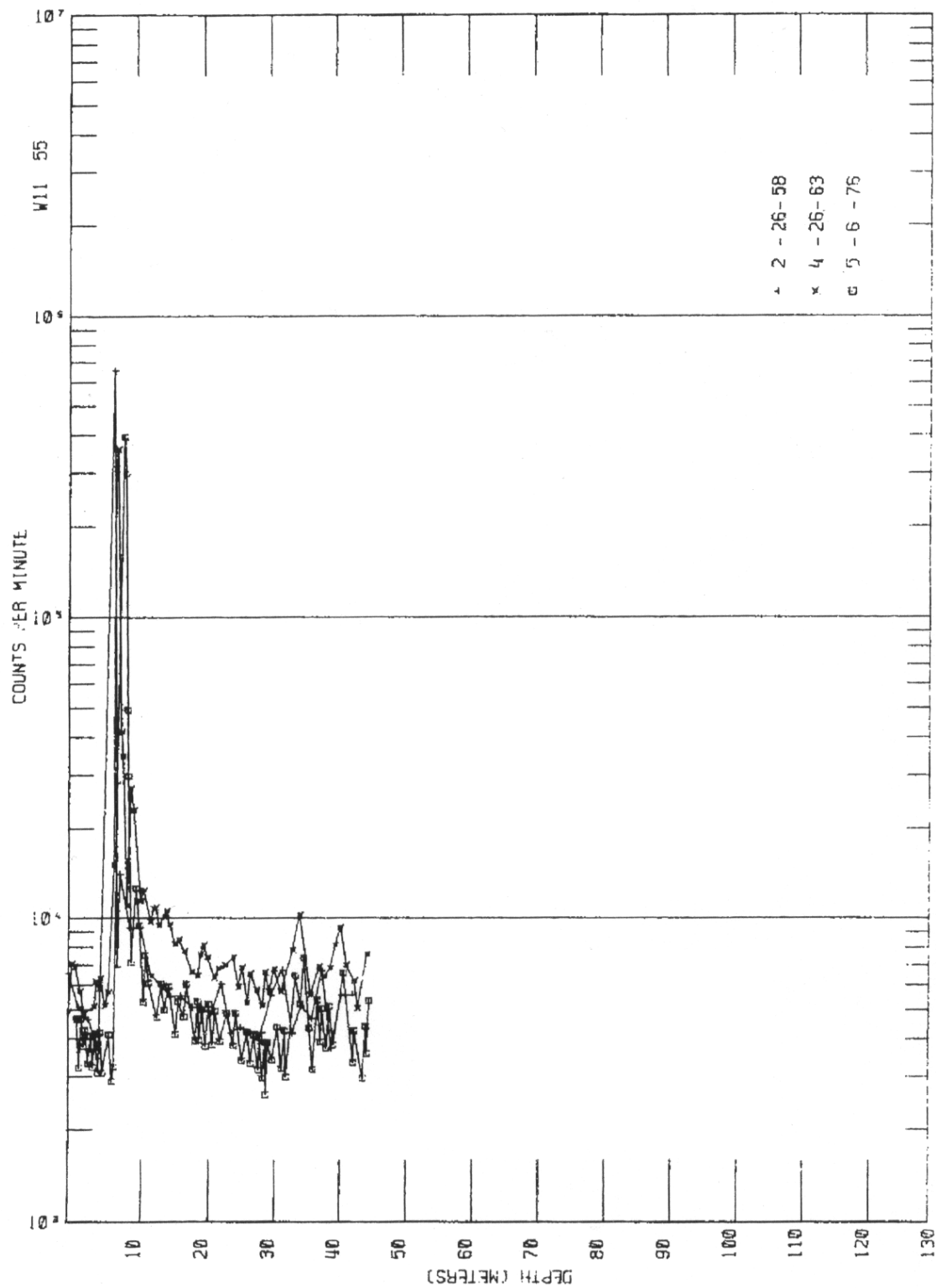
Fecht, K.R., G.V. Last, and K.R. Price, 1977. *Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells*, ARH-ST-156, Atlantic Richfield Hanford Company, Richland, Washington.

¹ GWL – groundwater level

² TOC – top of casing

³ HWIS – Hanford Well Information System

⁴ N/A – not applicable

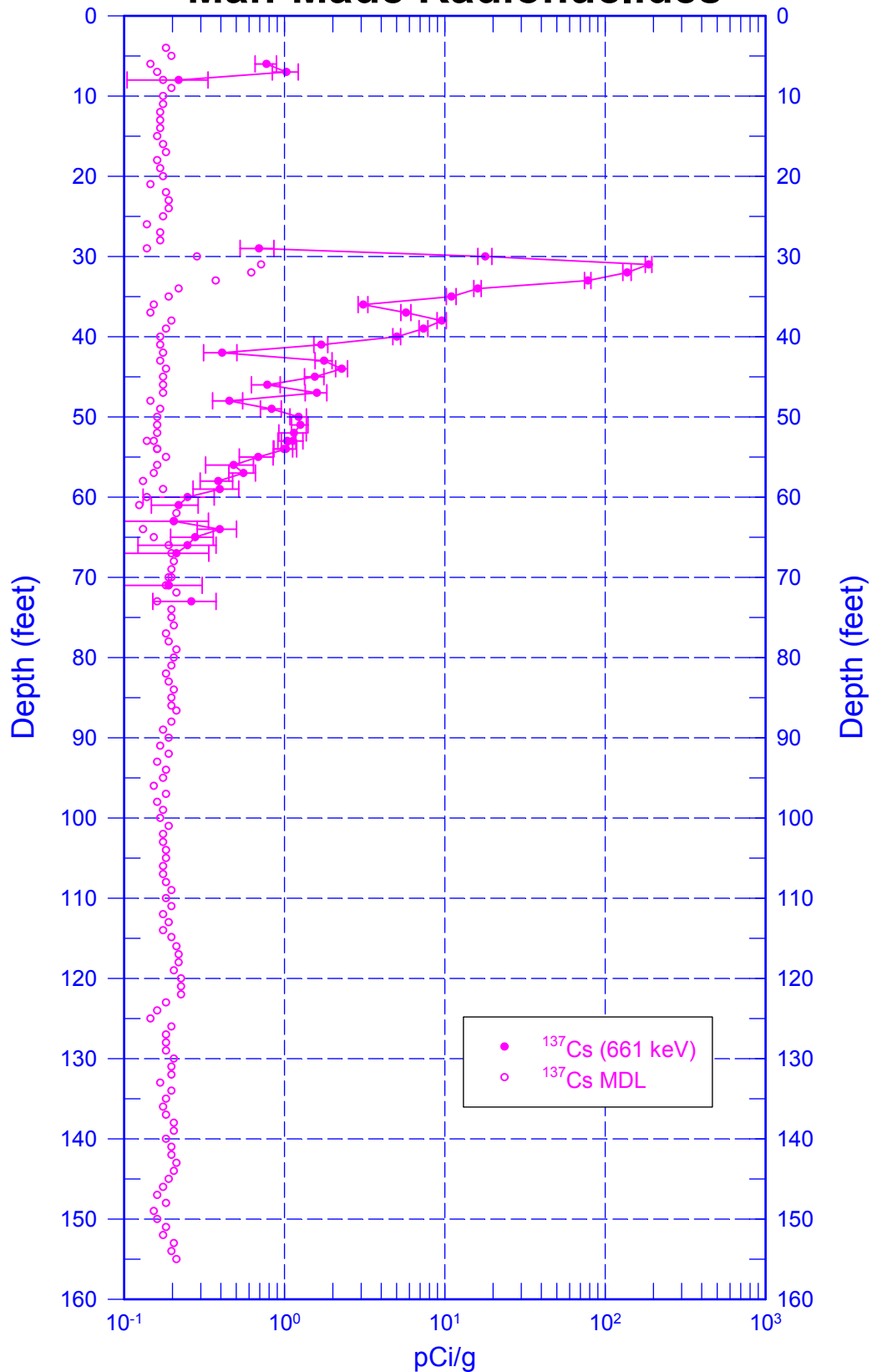


from Fecht et al. (1977)

Scintillation Probe Profiles for Borehole 299-W11-55, Logged on 2/26/58, 4/26/63, and 5/6/76

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Man-Made Radionuclides

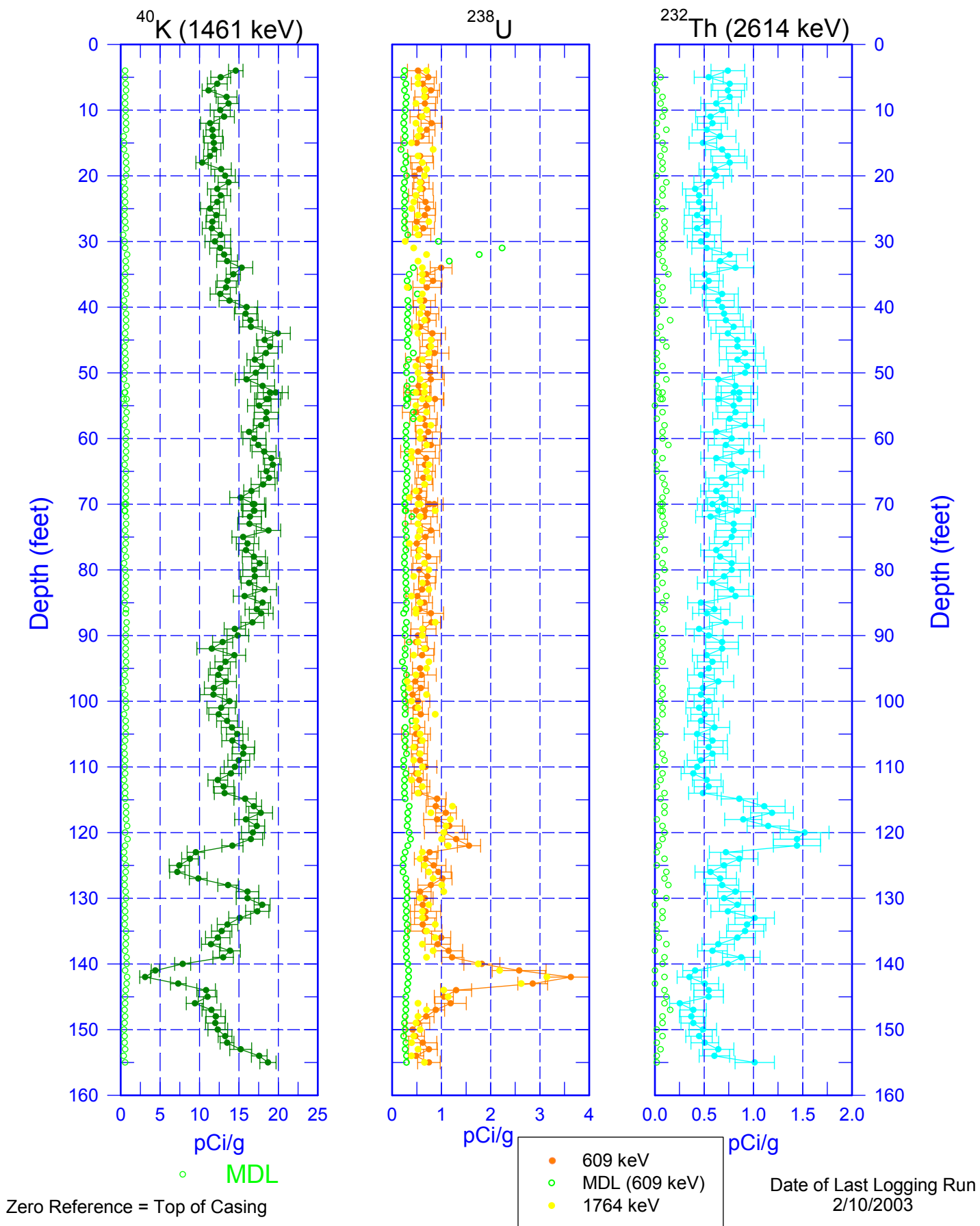


Zero Reference = Top of Casing

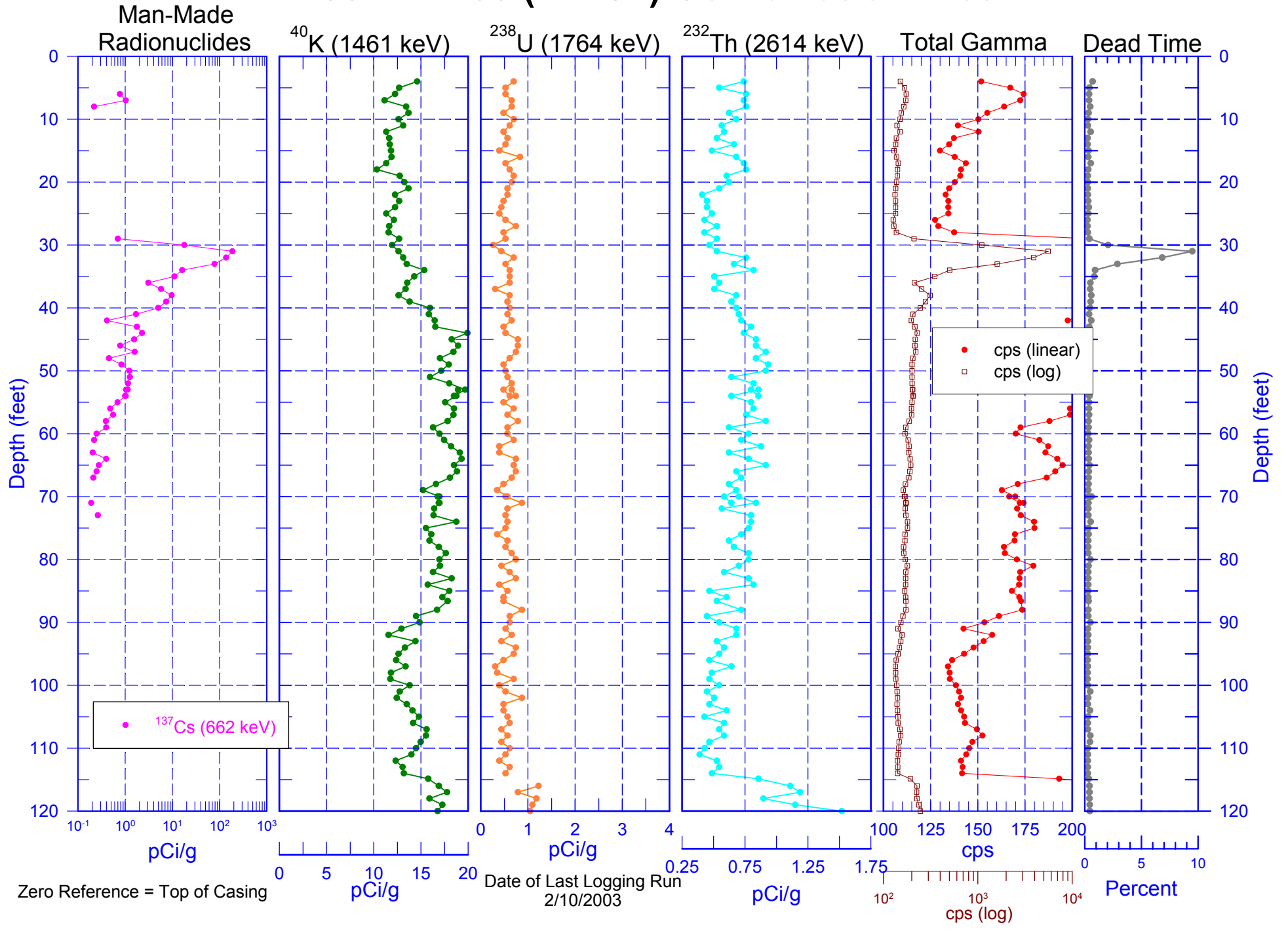
Date of Last Logging Run
2/10/2003

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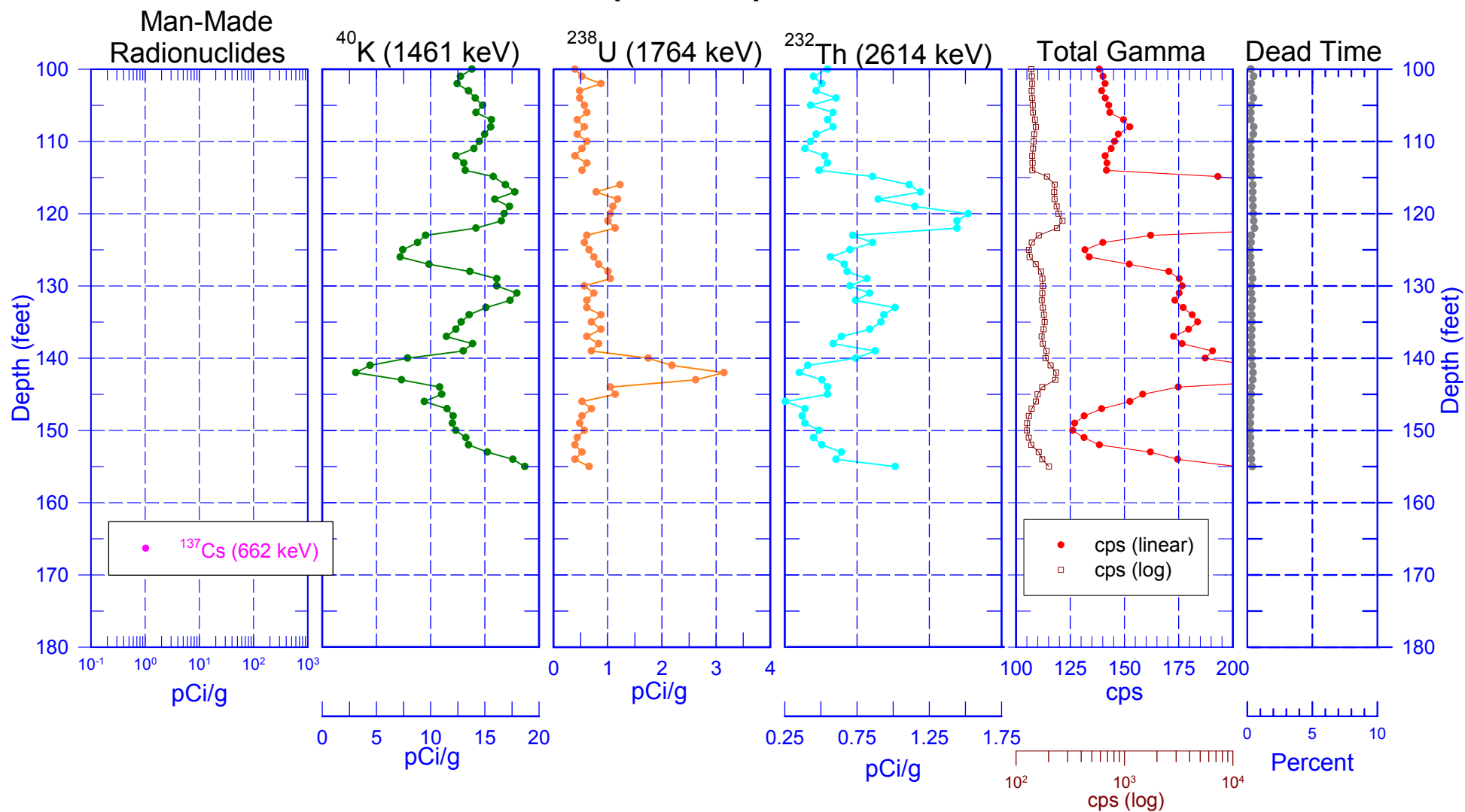
Natural Gamma Logs



299-W11-55 (A7297) Combination Plot



299-W11-55 (A7297) Combination Plot

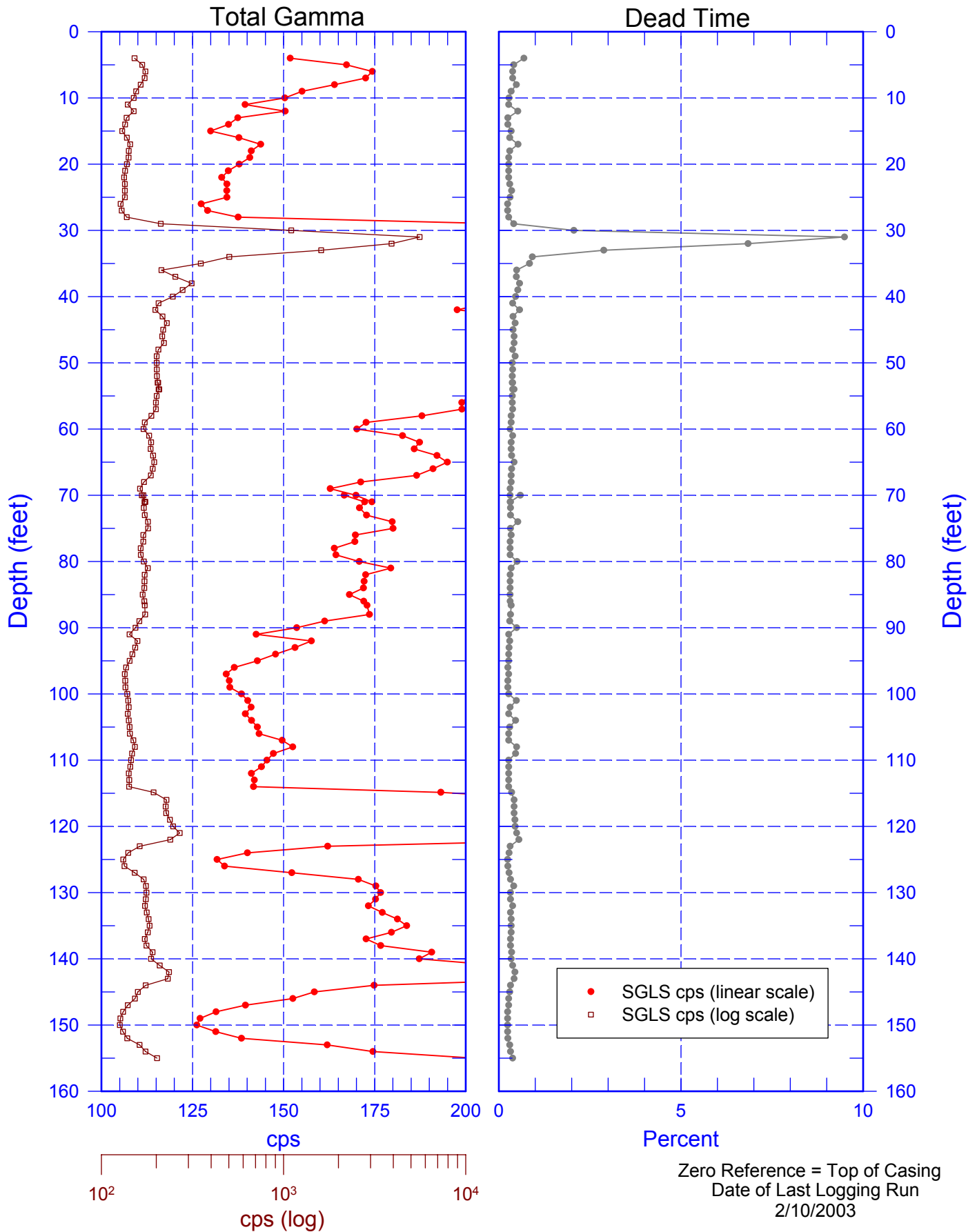


Zero Reference = Top of Casing

Date of Last Logging Run
2/10/2003

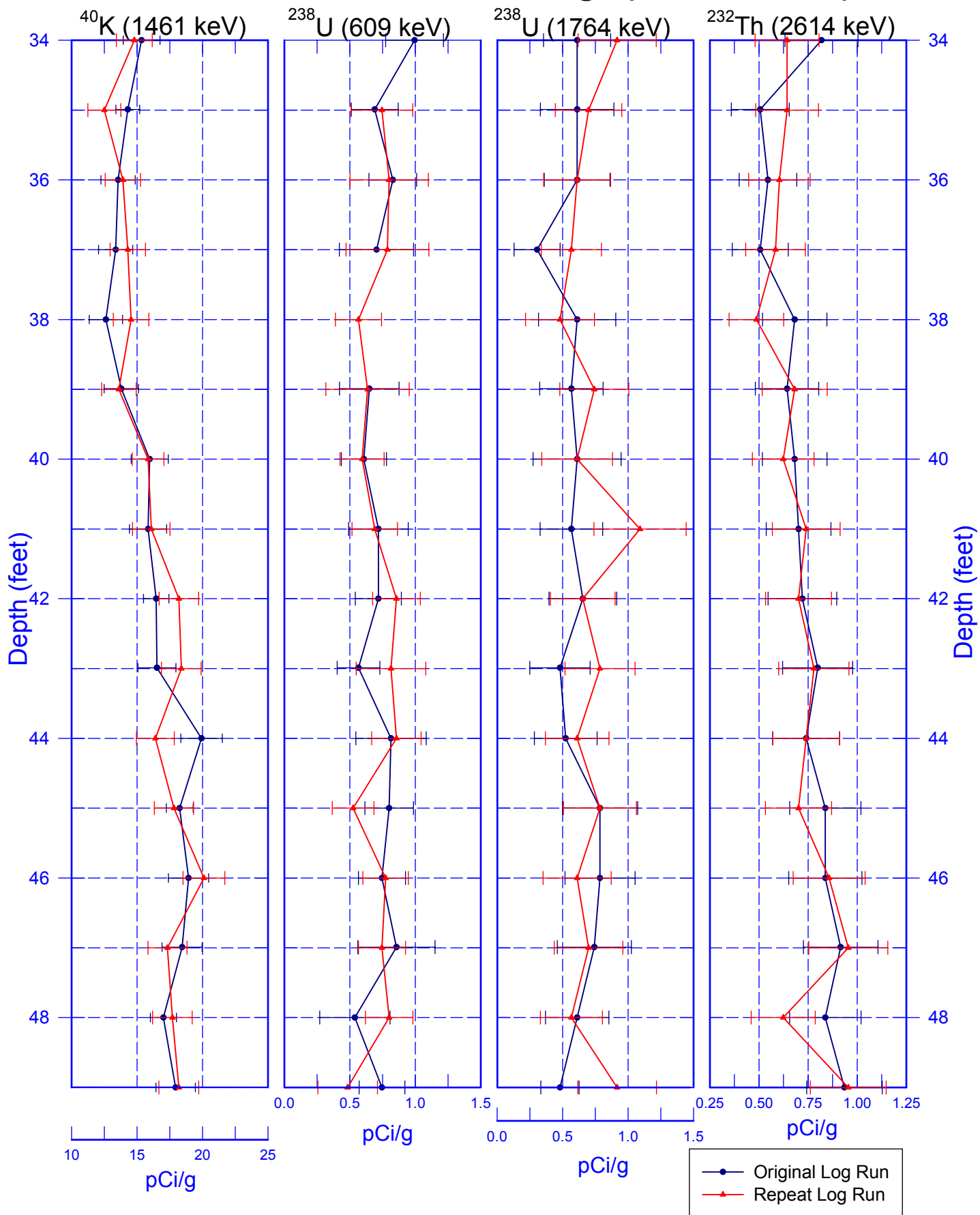
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Total Gamma & Dead Time



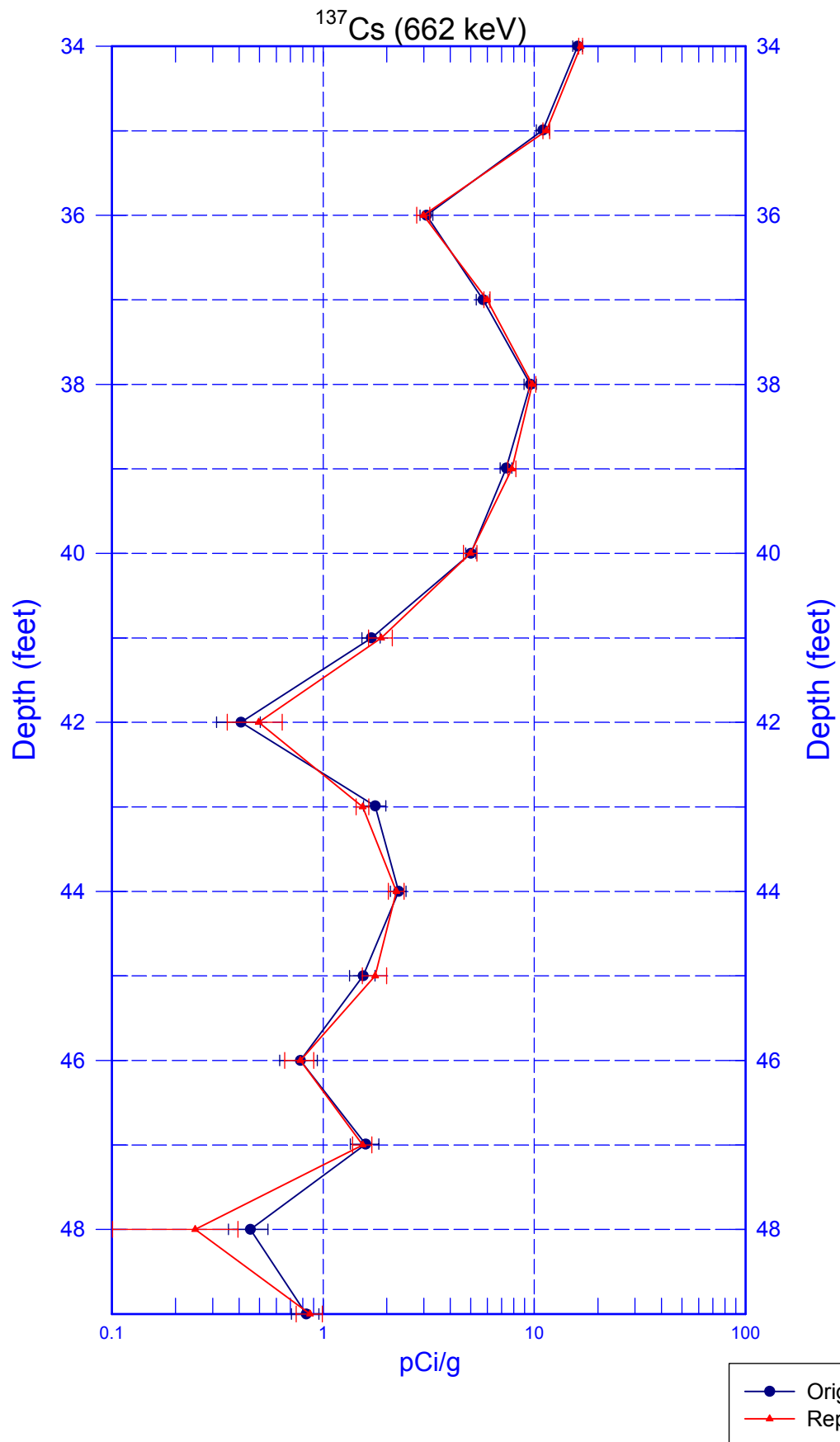
299-W11-55 (A7297)

Rerun of Natural Gamma Logs (49.0 to 34.0 ft)



299-W11-55 (A7297)

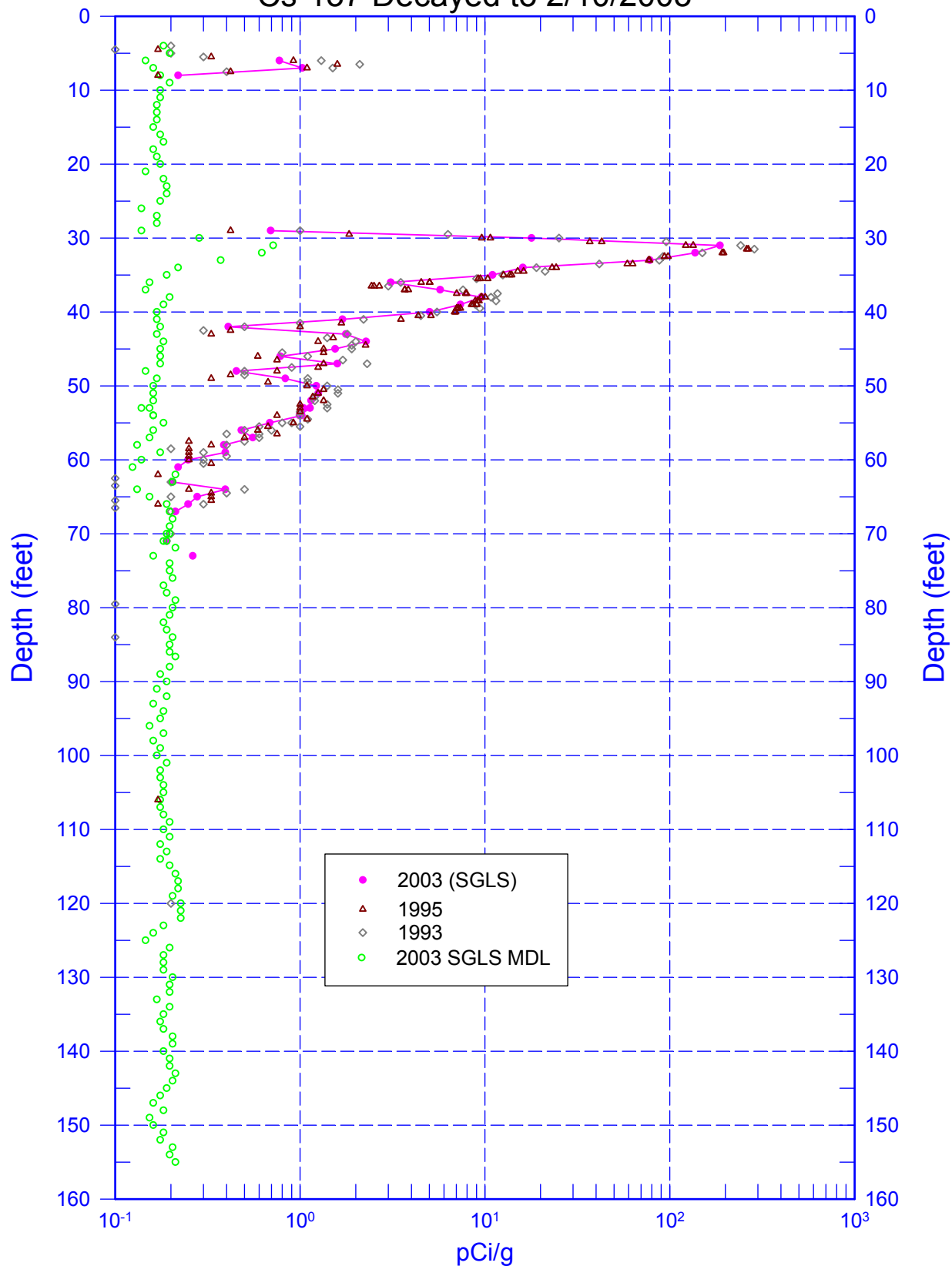
Rerun of Man-Made Radionuclides (49.0 to 34.0 ft)



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RLS Data Compared to SGLS Data

Cs-137 Decayed to 2/10/2003



Zero Reference = Top of Casing (2003 SGLS & 1995 RLS)
1993 RLS shifted +3.0 ft to align with the SGLS